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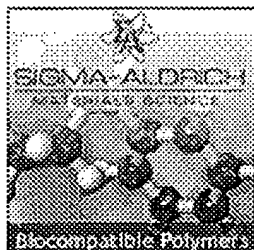
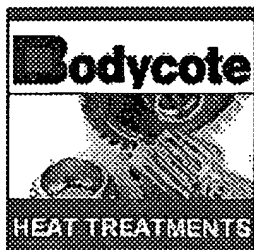
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Hydroxyapatite

Chemical formula
 $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$

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Background

Hydroxyapatite is chemically similar to the mineral component of bones and hard tissues in mammals. It is one of few materials that are classed as bioactive, meaning that it will support bone ingrowth and osseointegration when used in orthopaedic, dental and maxillofacial applications.

The chemical nature of **hydroxyapatite** lends itself to substitution, meaning that it is not uncommon for non-stoichiometric hydroxyapatites to exist. The most common substitutions involve carbonate, fluoride and chloride substitutions for hydroxyl groups, while defects can also exist resulting in deficient hydroxyapatites

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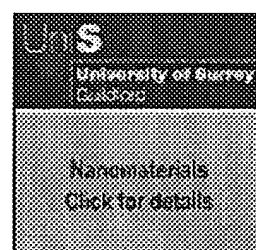
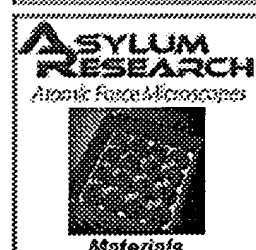
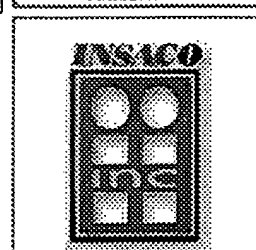
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Key Properties

- The ability to integrate in bone structures and support bone ingrowth, without breaking down or dissolving (i.e it is bioactive).
- **Hydroxyapatite** is a thermally unstable compound, decomposing at temperature from about 800-1200°C depending on its stoichiometry (see above).
- Generally speaking dense **hydroxyapatite** does not have the mechanical strength to enable it to succeed in long term load bearing applications.

Applications

Bioceramic Coatings

Coatings of **hydroxyapatite** are often applied to metallic implants (most commonly titanium/titanium alloys and stainless steels) to alter the surface properties. In this manner the body sees **hydroxyapatite**-type material which it is happy to accept. Without the coating the body would see a foreign body and work in such a way as to isolate it from surrounding tissues. To date, the only commercially accepted method of applying **hydroxyapatite** coatings to metallic implants is plasma spraying.

Bone Fillers

Hydroxyapatite may be employed in forms such as powders, porous blocks or beads to fill bone defects or voids. These may arise when large sections of bone have had to be removed (e.g. bone cancers) or when bone augmentations are required (e.g maxillofacial reconstructions or dental applications). The bone filler will provide a scaffold and encourage the rapid filling of the void by naturally forming bone and provides an alternative to bone grafts. It will also become part of the bone structure and will reduce healing times compared to the situation, if no bone filler was used.

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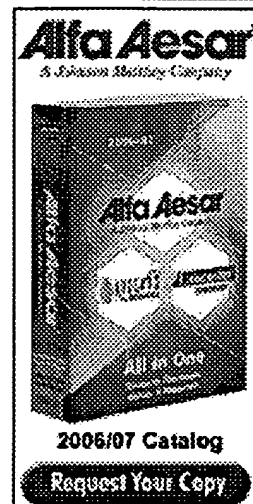
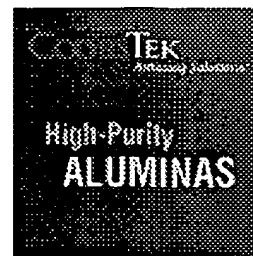
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